PATCH PLUG

FIELD OF THE INVENTION

The present invention relates to a path plug for transmitting high-speed electric signals and particularly to a patch plug that conforms to EIA/TIA Category 6 standards.

BACKGROUND OF THE INVENTION

In response to the high-speed network applications beyond Ethernet, the working groups of Telecommunication Industry Associations (TIA) of U.S.A. published Category 6 standards (ANSI/TIA/EIA-568-B.2-1) in June of 2000. The category 6 standards, besides expanding from 100MHz of Category 5 standards to 200MHz, also require the performance to be enhanced at least 25 % over the Category 5 standards. Some performance test frequency for Category 6 even reaches 250MHz. The biggest difference between the Category 6 and Category 5 standards is the performance improvement on crosstalk and return loss. For the new generation of full duplex high-speed network applications, good return loss performance is very important. The crosstalk performance is an important factor to control frequency bandwidth. Although 100Mbps is still the main stream of the present network configurations, the Category 6 standards will be more desirable to meet future requirements.

The standards set forth above not merely target high-speed communication wires. In order to maintain high-speed transmission performance in the high-speed communication network systems, the peripheral equipment related to the high-speed communication wires, especially telecommunication connection elements (such as RJ-45 type plug and jack) also require a corresponding design. There are many types of connectors. The patch plug is one of them. Most connector products now on the market

merely focus on the improvement of the jack portion. Very few focus on the improvement of the plug portion. Hence it often happens that the high-speed cables and jacks conform to the Category 6 standards, but the plug portions have too much interference. As a result, the total system still can reach only the Category 5 standards or even lower.

To remedy this problem, U.S. patent No. 6,062,895 discloses a patch plug with contact blades, that has pairs of spaced electrical conductors close to each other so that the interval is shrunk and is moved away from the neighboring electrical conductors to reduce crosstalk and interference of telecommunication signals. However, such a compensation scheme still cannot reach the EIA/TIA Category 6 standards.

SUMMARY OF THE INVENTION

The object of the invention is to provide a patch plug to conform to ANSI/TIA/EIA-568-B.2-1/Category 6 transmission standards (hereinafter called EIA/TIA Category 6 standards).

The patch plug according to the invention includes a shell and a plurality of electrical conductors. The shell has a housing space, which has one end to receive a communication wire and another end containing a plurality of insertion slots to accommodate the electrical conductors. Each of the electrical conductors has a contact portion at one end exposed outside the housing space and a piercing end at another end located in the housing space. The piercing end can contact the communication wire. The electric conductors are paired and defined in different electricity and laid in a spaced manner. The insertion slots can make the interval of every pair of electrical conductors smaller than the distance between the neighboring pairs of electrical conductors. And the piercing ends of at least one pair of the electrical conductors are crossed to abut onto

the piercing ends of neighboring electrical conductors that have the same electricity, so that capacitance compensation is generated to conform to EIA/TIA Category 6 standards, thereby improving transmission quality and performance.

The foregoing, as well as additional objects, features and advantages of the invention will be more readily apparent from the following detailed description, which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A, 1B and 1C are schematic views of the invention.

FIG. 2 is a schematic view of a first embodiment for capacitance compensation of the invention.

FIG. 3 is a schematic view of a second embodiment for capacitance compensation of the invention.

FIGS. 4A and 4B are schematic views of a third embodiment for capacitance compensation of the invention.

FIG. 5 is a schematic view of a fourth embodiment for capacitance compensation of the invention.

FIG. 6 is a schematic view of a fifth embodiment for capacitance compensation of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1A, 1B and 1C, the patch plug according to the invention includes a shell 10 and a plurality of electrical conductors 20. The shell 10 consists of a base 11 and a cap 12, and conforms to the 110-type structure. The base 11 and the cap 12 are

coupled to form a housing space which has one end to allow a communication wire 30 to pass through and be held in the housing space and another end forming a plurality of insertion slots 111 to anchor the electrical conductors 20.

The electrical conductors 20 are formed in pairs, as shown in the drawings, include a first electrical conductor 21, a second electrical conductor 22, a third electrical conductor 23, a fourth electrical conductor 24, a fifth electrical conductor 25, a sixth electrical conductor 26, a seventh electrical conductor 27 and an eighth electrical conductor 28. They are similarly constructed. Take the first electrical conductor 21 as an example. It has one end exposed outside the shell 10 to form a contact portion 211 and another end formed a piercing end 212. The electrical conductors are paired. Namely, the first electrical conductor 21 and the second electrical conductor 22, the third electrical conductor 23 and the fourth electrical conductor 24, the fifth electrical conductor 25 and the sixth electrical conductor 26, the seventh electrical conductor 27 and the eighth electrical conductor 28 form respectively four pairs of electrical conductors. Through the insertion slots 111, the interval of each pair of electrical conductors is smaller than the interval of the neighboring pairs of electrical conductors. For instance, the interval of the third electrical conductor 23 and the fourth electrical conductor 24 is smaller than the interval of the third electrical conductor 23 and the second electrical conductor 22. The same principle is applied to the rest of the electrical conductors.

Meanwhile, the two electrical conductors of each pair have different electricity. For instance, if the first electrical conductor 21 is T (tip), the second electrical conductor 22 is R (ring). Similarly, if the third electrical conductor 23 is T (tip), and the fourth electrical conductor 24 is R (ring); the fifth electrical conductor 25 is T (tip), and the sixth electrical conductor 26 is R (ring); the seventh electrical conductor 27 is T (tip), and the eighth electrical conductor 28 is R (ring). Hence the T and R are arranged in an

alternate manner. Furthermore, at least one pair has the piercing ends 212 crossed to be abutting neighboring electrical conductors of the same electricity. Refer to FIG. 1B for example. The third electrical conductor 23 and the fourth electrical conductor 24 are crossed so that the piercing end of the fourth electrical conductor 24 is abuts onto the second electrical conductor 22, and the piercing end of third electrical conductor 23 abuts onto the fifth electrical conductor 25. Thus the electrical conductors of the same electricity may be close to each other to generate capacitance compensation. Applying the foregoing example, the fourth electrical conductor 24 has an electricity of R, and the second electrical conductor 22 also has an electricity of R. The two electrical conductors are close to each other to generate an RR effect. On the other hand, the third electrical conductor 23 and the fifth electrical conductor 25 have the same electricity of T, therefore they generate a TT effect. The cross of the electrical conductors is preferably selected from the non-neighboring ones. For instance, also referring to FIG. 2, the seventh electrical conductor 27 crosses the eighth electrical conductor 28 so that the piercing ends of all electrical conductors of the same electricity abut one another. Similarly, crossing the first electrical conductor 21 with the second electrical conductor 22, and the fifth electrical conductor 25 with the sixth electrical conductor 26 also can generate the same effect. However, the capacitance compensation effect generated by simple crossing is limited. An improved approach elaborated below can further enhance the capacitance compensation effect for the patch plug to conform to EIA/TIA Category 6 standards.

The approach is to make the rest electrical conductors in parallel spatially, to increase the capacitance compensation value. Refer to FIG. 2 for a first embodiment of the invention. In addition to the compensation mentioned above, the piercing end of the electrical conductors is extended to form an extension. As shown in the drawing, the second electrical conductor 22 has a distal end extended to form an extension 223; the

third electrical conductor 23 has a distal end extended to form an extension 233; the fourth electrical conductor 24 has a distal end extended to form an extension 243; the fifth electrical conductor 25 has a distal end extended to form an extension 253; the sixth electrical conductor 26 has a distal end extended to form an extension 263; and the eight electrical conductor 28 has a distal end extended to form an extension 283. These extensions are located on the same horizontal surface and in parallel and close to each other. Namely, the extension 223 of the second electrical conductor 22 and the extension 243 of the fourth electrical conductor 24 are located on the same horizontal surface and are extended longitudinally upwards, close to-, and parallel with each other. The extension 233 of the third electrical conductor 23 and the extension 253 of the fifth electrical conductor 25 are located on the same horizontal surface and are extended longitudinally and close to-, and parallel with each other. The extension 263 of the sixth electrical conductor 26 and the extension 283 of the eighth electrical conductor 28 are located on the same horizontal surface and are extended longitudinally upwards and close to-, and parallel with each other. Such arrangements can greatly increase the capacitance compensation value to reach EIA/TIA Category 6 standards.

Refer to FIG. 3 for a second embodiment of the invention. The extension 223 of the second electrical conductor 22 and the extension 243 of the fourth electrical conductor 24 are located on the same horizontal surface and extended longitudinally downwards to be close to each other in parallel; the extension 233 of the third electrical conductor 23 and the extension 253 of the fifth electrical conductor 25 are located on the same horizontal surface and extended transversely to be close to each other in parallel; the extension 263 of the sixth electrical conductor 26 and the extension 283 of the eighth electrical conductor 28 are located on the same horizontal surface and extended longitudinally downwards to be close to each other in parallel.

Referring to FIGS. 4A and 4B for a third embodiment of the invention, in which only

the third electrical conductor 23 and the fifth electrical conductor 25 have respectively an extension 233 and 253. And instead of being located on the same horizontal level, they are in parallel and close to each other on a vertical surface. Variations may be made on the vertical surface the same as that on the horizontal surface. Details are omitted.

FIG. 5 illustrates a fourth embodiment of the invention. Only the third electrical conductor 23 and the fifth electrical conductor 25 have respectively an extension 233 and 253. They are located on the same horizontal level and extended longitudinally upwards in parallel, and close to each other.

FIG. 6 illustrates a fifth embodiment of the invention. Aside from having the extension close to the piercing end as previously discussed, the extension may also be formed from a middle portion of the electrical conductor. As shown in the drawing, the third electrical conductor 23 and the fifth electrical conductor 25 have respectively an extension, 233 and 253, extended from the middle portion thereof. They are in parallel and close to each other in various fashions as the ones extending from the piercing ends.

While the preferred embodiments of the invention have been set forth for the purpose of disclosure, modifications of the disclosed embodiments of the invention as well as other embodiments thereof may occur to those skilled in the art. Accordingly, the appended claims are intended to cover all embodiments, which do not depart from the spirit and scope of the invention.